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09/346,436 07/01/99 HOUSTON

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EXAMINER

023494

MMC2/0122

TEXAS INSTRUMENTS INCORPORATED

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KTEI IN.F

ART UNIT

PAPER NUMBER

2813

DATE MAILED:

01/22/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/346,436

Applicant(s)

Houston

Examiner

Erik Kielin

Group Art Unit

2813

☒ Responsive to communication(s) filed on Nov 21, 2000

☒ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claims

☒ Claim(s) 1-4, 7-9, and 18-24 is/are pending in the application.

Of the above, claim(s) _____ is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 1-4, 7-9, and 18-24 is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☒ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been
☐ received.

☐ received in Application No. (Series Code/Serial Number) _____.

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☐ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

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DETAILED ACTION

Drawings

1. The corrected or substitute drawings were received on 11/21/00. These drawings are acceptable for examination purposes. New formal drawings will be required when the application is allowed.

Claim Objections

2. Amended claim 1 is objected to because of the following informalities:
in line 2 of step (b), after "surface" insert --of-- for clarity.
Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 7-9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 7 recites the limitation "said surface" in the last line. There is insufficient antecedent basis for this limitation in the claim. Note that each of the substrate, the device layer, and the dielectric layer are indicated to have "a surface;" therefore, it is unclear to which "said surface"

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Applicant is referring. Claims 8-9 are rejected for having all of the limitations of independent claim 7.

5. Claim 22 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As presently written, it is unclear how the electrically conductive path is formed "by breakdown of said dielectric" when there is no indication in claim 18 (from which claim 22 depends) that there exists dielectric material between the interconnect and one of the device layer and the substrate. Note that, as amended, claim 18, in step (c), requires the interconnect to extend to the surface of the dielectric layer. It is unclear how dielectric breakdown is required if the interconnect extends to the surface of the dielectric layer.

Examiner suggests that Applicant *more clearly describe the "interface"* formed when the dielectric layer is bonded to the other of the device layer and the substrate -- perhaps indicating that some thin portion remains over the interconnect thereby preventing electrical connection. This is only a suggestion. Clearly, other description may be appropriate to describe Applicant's invention.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1, 3, 7-9 and 18-21, 23-24 are rejected under 35 U.S.C. 102(b) as being anticipated by Hayashi (US 5,087,585).

Regarding claims 1 and 3, Hayashi discloses a method of fabricating an SOI structure comprising:

(a) providing a substrate 21, 22 (Fig. 2B) having at least one of active or passive elements on a surface thereof (i.e. the "first layer device" 22) and a device wafer 14, 15, 23 having at least one of active or passive elements on a surface thereof (i.e. "second layer thin film device" 23);

(b) forming an electrically insulating layer 17 having opposed faces on the surface of one of the substrate and the device wafer and having an electrical interconnect structure 18 therewithin and extending to at least one face; and

(c) bonding said electrically insulating layer to the substrate at the bond region 13, a refractory metal bump, wherein the interconnect structure 18 contacts the bond region (Figs. 2B-2C).

Regarding claims 7-9, Hayashi discloses a method of fabricating an SOI structure comprising:

providing a substrate 21, 22 (Fig. 2B), with a planar surface, having at least one of active or passive elements on a surface thereof (i.e. the "first layer device" 22); a device wafer 14, 15, 23, with a planar surface, having at least one of active or passive elements on a surface thereof

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(i.e. "second layer thin film device" 23); and an electrically insulating layer 17 having an electrical interconnect structure 18 therewithin and extending to a surface thereof, said interconnect structure separating a portion of said device layer from said substrate;

Regarding claims 18-21, and 23-24, Hayashi discloses a method of fabricating an integrated circuit comprising:

- (a) providing a device layer 23 having devices (Fig. 2B);
- (b) providing a substrate 21 having devices 22 thereon;
- (c) providing a dielectric 17 bonded to one of said device layer and said substrate having an interconnect 18 disposed therein and extending to at least one surface thereof; and
- (d) then bonding said dielectric to the other of said device layer and said substrate to form an interface with said one of said device layer and said substrate and forming an electrically conductive path across said interface to said interconnect.

See also columns 3-4 and column 5, lines 11-16.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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9. Claims 1-4, 7-9 and 18-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Hayashi** in view of **Applicant's admitted prior art**.

Hayashi, as indicated above, discloses all of the features of the instant invention except for applying a voltage across the electrically insulating layer to break down said portion of said electrically insulating layer.

On page 7, lines 7-12, **Applicant** indicates that it is known in the art to break down oxide by applying voltage across an electrically insulating layer.

It would have been obvious to one of ordinary skill in the art at the time the invention was made because native oxide (i.e. the electrically insulating layer) inherently forms on all metals (perhaps with the exception of gold) --particularly **Hayashi's** refractory metal bump and indium metal pool-- and for the reasons indicate by **Applicant**.

Response to Arguments

10. Applicant's arguments filed 11/21/00 have been fully considered but they are not persuasive.

Applicant argues that **Hayashi** does not provide all of the steps and/or features of the instant invention but without supporting arguments; therefore, it is not possible for Examiner to address **Hayashi** other than to indicate that, as presently written, **Hayashi** discloses all of the features for the reasons already indicated.

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Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Riout (US 3,787,822) teaches applying a voltage across a dielectric interface 16 between conductive metal layers 12, 15 interface to remove native metal oxide from interconnect material (Abstract).

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

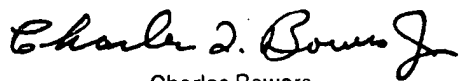
A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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Any inquiry concerning this communication from examiner should be directed to Erik Kielin whose telephone number is (703) 306-5980. The examiner can normally be reached by telephone on Monday through Thursday 9:00 AM until 7:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Charles Bowers, can be reached on (703) 308-2417. The fax phone number for the group is (703) 308-7722 or -7724.


EK


Charles Bowers
Supervisory Patent Examiner
Technology Center 2800

January 17, 2001